E-1

UNITED STATES
DEPARTMENT OF THE INTERIOR

DI-6

APPROVED DECEMBER 1941

Engineer Book

3

E-1

Samples to Cole

A - top foot
B - 18" from bottom } #1 2003 - 2028

C - 2805 } #2
D - 2807 } 2802 - 2808

} sent 7/5/5-2

Notes on cores -

#1 - 2003 - 2028 - pp 15, 16
2 - 2802 - 2808 - p 21
3 - 4078 - 4100 - p 29
4 - 4208 - 4211 - pp 35-37
5 - 4211 - 4216 } pp 38-41
6 - 4216 - 4222 }

Notes on cuttings

p. 3, 7, 17, 25, 31

Notes on cuttings

p. 3, 7, 17, 25, 31

Book 3 1952

E-1 Eniwetok - Site Elmer

June 24 ~ Tues - 8 AM - 4 PM - [illegible]

Spudded in 10 AM

0-10 - No sample; all measurements from top of rotary table [illegible] above MLWS.

10-20 - 1 sack
20-30 - 1 "
30-35 - 2 "
35-40 - 2 "
40-45 - 2 "

Samples caught in trough, using chain as dam, cleaning out trough each time. Hard rock 18-21' - probably beach rock belt - intertidal. [illegible]

12:00 - [illegible] out hole, stirring up mud and adding fiber [illegible]

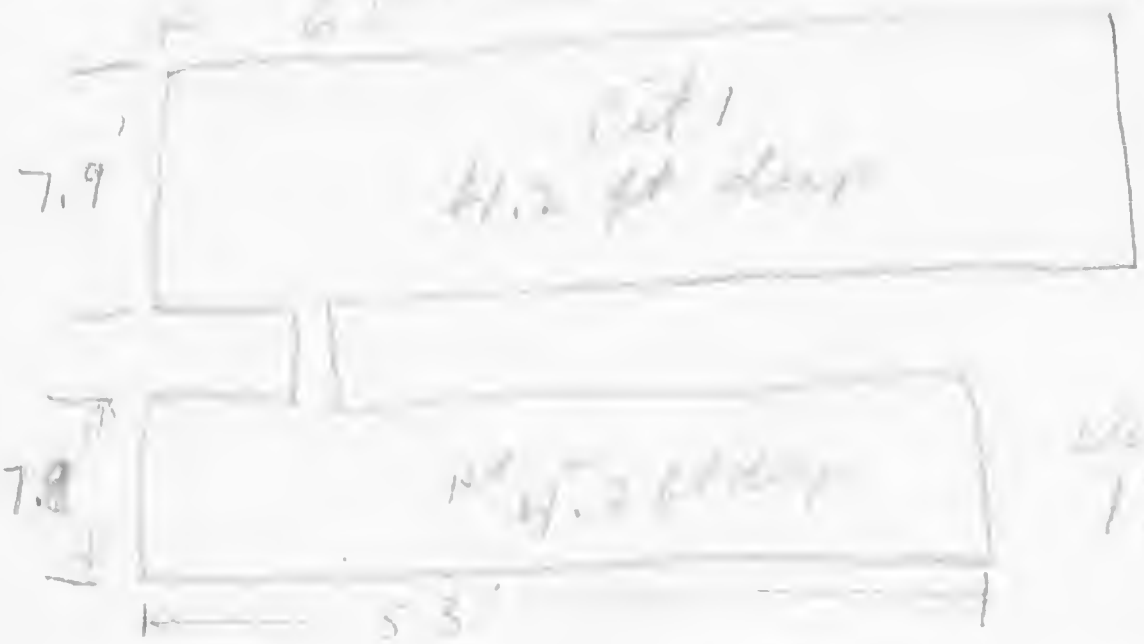
45-74

74'-82' [illegible]
[illegible] drilling time [illegible] made [illegible] [illegible] [illegible] [illegible] [illegible] for 10-ft [illegible]

E-1

Samples to Cole

Capacity of mud pits



Total vol of pits [7.48 gals per cu ft.

38992 cu ft

Cap. of pits — 291,190 gals.

- Hard 85-86'
- drilled to 130' & nearly stuck in hole in

- Hard 85-86'
- drilled to 130'; nearly stuck in hole in attempting to make connection;
- on to ~~145~~ 146 - pulled out to ream.
Totco ½°

June 25 ~ Wed.
Finished reaming 4:30 AM; circulated and built up mud to viscosity 42 (added 16 sacks Aquagel and 2 of lime) - heavy cuttings coming out at 6:30 -
- 8:30 pulled out of hole to run casing
- 9:30 start running casing
- 11:00 - last of 4 lengths 13⅜" casing in.
- 12:00 finished cement - 130 sacks.

June 26 ~ Thurs
W.O.C. - relined brakes, etc
Mixed pit Zeogel

June 27 ~ Fri ~ 7AM - 4PM Leda

Drilling thru 40' cement
10:AM - out of cement at 146'
12:25 PM - lost circulation 430
shut down to add Fiberdex, sawdust and red wood
12:45 - drill to 456 - circulating returns
- irregular - gone again 475 - back in 2½ minutes but volume low
(see p. 4) - gone to 480' - moving 500 - 508 - worked loose

Notes on Cuttings – E-1

10 – 20' Cream-colored sand made up chiefly of more or less worn "beach type" forams (Calcarina many with spines or spine bases, Marginopora and others). Homotrema fragments, [illegible] spines and [illegible] pieces rounded coral – worn plates Halimeda.

20 – 3[illegible] [illegible] similar to last with frag + unbroken moll. shells, many spiny Calcarinas and worn coral frags. up to 2½" – Halimeda rare

30 – 35 Mostly fresh segments of Halimeda + spiny Calcarinas, bryozoans, frag. corals, moll. (small) – some coral + some moll. well preserved

35 – 40 Same as last – Halimeda debris

40 – 45 Same as 30-35'

45 – 50 Rounded coral and algal gravel and worn frag. shell, some fragments well cemented as composed of forams and other debris; few pieces [illegible]; few Homotrema; worn [illegible] large [illegible] spines; many of [illegible] fragments are freshly broken and apparently are from larger heads broken by drill; Halimeda – many worn [illegible] like beach gravel; some [illegible] beach ss.; Calcarinas abundant in fine fraction – mostly badly worn.

50 – 60 Similar to last – [illegible] – some [illegible] very fresh – [illegible] Calcarinas [illegible] [illegible]

(see p. 7)

on @ 595, shut down to clean and prime pumps - clogged by lost-circ. material
on to 600 without further loss circ.

6/22 - 4 PM - midnight - Ingerson
Hard layer at 1155 to 1168
Circulation lost at 1168.

6/23/32 Sat midnight - 8 AM Russell.

12 M. Building up mud and lost circulation material.

1.00 A.M. lost circulation material fouled pumps, shut down to repair

→ 1167 - 1174 - open cavity

2.25 A.M. Pumps unable to deliver even 100 lbs pressure. Pump [illegible] rubber piston [illegible] are bad. Plans to shut down to repair as soon as mud pits are inspected.

3.25 A.M. Depth 1207.
- Sent [illegible] [illegible] [illegible] to start pump repair.

3.45 AM.
Rubber washers on pump (bolt) pistons completely shot. This explains all pump troubles of last ~~few~~ days.

6.25. Water pump cooled out - then fixed. Waiting for pits to fill. Will drill with sea water from here on down to next casing (unless ordered to mix another batch of mud by someone else)

6.45 - Drilled to 1207. ~~Bit refused~~ To drill down. Bucks badly. Philly thinks a lost steel pin from rotary table [illegible] at bottom of hole.

June 28 - Sat - 8AM - 4PM - Ladd

- Coming out of hole from 1207 to see bit
(sample in small bag) - Bit with piece hard rock stuck in center. Cones frozen, shows same wear but not from drilling on bolt ; put on

new bit. Behavior of bit evidently due to piece rock lodged between cones.

7:00 - start back in hole. Mud supply now down to 116± bags; will have to go ahead with sea water; arranging for another salt water line to keep pits full.

25 min. (? rate for 2½ hrs.)

- 45' cavings in hole
- back to hard layer 1207 - drilled very hard for 2 in. (15-16,000 lbs on bit); still hard below (? 20,000 lbs)
- 9:30 have drilled 4 ft (to 1211) - still hard - pulled up [illegible] and shut down to refill pits, [illegible] salt water line.
- 11:35 drilled into softer material at 1211½

- 11:55 down to 1228 ft, pull up 2 stands and wait on water - last 8' (1220-1228) in 7 minutes.
- 2 PM - drilled 1230-1240' in 24 min (23 min for first 5'; 1 min. for last 5') - int. 1235-40 not cavity, not rough - just soft.

- 1240-45 soft } 15 min,
- 1245-50 firm }

- 2:30± pulled up - to refill pits; 3rd water line installed

Notes on cuttings — cont.

50-60	— cont. from p.3 — branching algae numerous in coarser fraction — small pelecy. both valves
60-70	— no essential change — looks like lagoon fauna close to shore — & [illegible] material even coral, moll., etc. [illegible] Cypraea [illegible]
70-80	Few coral pieces similar to last but bulk of sample caught on 1/16" screen after passing 1/4"; most abundant constituent *Halimeda* — many seg. worn or broken; moll. shells, urchin spines etc — more looks very fresh; finer grades contain many worn forams
80-90	Pieces larger than 1/4" few and consist mostly of cemented *Halimeda* debris (this probably the hard-drilling layers reported 76-82 and/or 85-86); some pieces coral well rounded. Finer portions like last
90-100 →	worn coral and ss; some of corals altered to yellow calcite; worn but megascopically bleached *Heliopora* encrusted with *Homotrema*; [note: many of *Halimeda* segments in this sample and higher are the "folded" type that Emery claims characterize the outer slopes]. Smaller forams fairly abundant in finer fractions

100-110	very few pieces above 1/4" - these like last; Calcarenite comp. few sh. fossil fractions Fines with last
110-120	Similar to last 2 intervals but with higher % broken coral, well pres. moll., frag. echinoid test; Halimeda seg. few; moll. molds; much yellow calcite
120-130	Fine cuttings; no essential change; frag. of small moll. shells and crustacea
130-145	Fine like last; yellow calcite (incl. moll. molds) abundant; Halimeda only in fragments
~~ ?	Coral ls
145-150	Coarse fragments mostly above 1/4" (up to 1"), many are rounded pebbles of worn coral, others are recryst. yellow calcite - dense except for sharp spaces representing organic molds (one sack of this sample contains practically no fines - samples from this interval taken after drilling out cement around surface casing and may not be good - coarse cuttings not washed out after reaming?) ← see other sack & mat. below - this sample prob. OK
150-160	Pieces larger than 1/4" mostly ^angular frag. dense, recryst. yellow ls. - largest piece 1/4"

(see p. 17)

June 28 - Sat. - 4 p.m. - 12 p.m. Ingerson.

4:15 10' firm layer at 1250-1260'

4:25 new length of drill stem; 1st 10' much softer

4:50 finish 30 min in 25 min.

4:57 new section started 8 min 2 ft 20 min first 15 ft 35 min 30 ft.

5:30 Stop drilling to let pits fill with water. Last 1 ft. softer (driller) 1330 ft.

6:08 Start drilling again, 10 ft. 11 min.

6:25 another length; took almost 1 hr., most of it on 1st 20 ft.

7:25 - 7:55 fill tanks again

7:55 another length; done in just over 10 min.

7:55 - 8:38 Entertained visitors from H+N, but drilling progressed nicely 1470' at 8:38

9:56 at 1592' time out to accumulate water.

10:15 Pulled 300' of pipe out of hole, to keep drill from getting stuck during delay.

Jan 10 Sunday Midnight - 8 AM. Campbell

12.50 ~~Econ~~ Still at 1592.
Were unable to make new connection because of accumulation of cuttings at bottom of hole. Pump pressure put off until [illegible] sent for test probe.

3:30 Still at 1592
Tool pusher explained why cannot be located. Told of [illegible] to keep trying to go ahead with an ...
The problem is this: it is possible to get to bottom of hole to start drilling but as soon as gets off bottom driller has to pull back a few stands to keep bit from sticking while waiting for
the pipe to fill. This period of inactivity permits cuttings to accumulate again. As pipe is put on fillers mist of water is used

Cleaning out cuttings leaving little or none for actual drilling.
Solution: get enough pumps ~~to keep up with~~ filling pits to keep up with flush pump which would make it unnecessary to shut down long enough for cuttings to accumulate.
When / Mañana.
4.45. Reached bottom - start drilling
5.35 A.M. Drilled to 1709
before water supply ran out.
Pulled up set and stand & waiting for pits to fill.
~~[illegible]~~

7.00 A.M. Starting back to bottom. Pit full.

JUNE 29 - SUN. - 8AM-4PM - [illegible]

	1710 — 20	—	3 min
	1720 — 30	—	3 "
	1730 — 40	—	2 "
	1740 — 50	—	3 "
	1750 — 60	—	3 "
	1760 — 70	—	2 "
	1770 — 80	—	2 "
8:45	1780 — 90	—	4

1790 – 1800 – 3 min
1800 – 1810 – 4 "
1810 – 1820 – 2 "
circulate for 20 min. – connections
in setting up third pump
1820 – 1830 – 4 "
1830 – 1840 – 4 "
1840 – 1850 – 2 "
1850 – 1860 – 2 "
1860 – 1870 – 2 "
1870 – 1880 – 2 "
1880 – 1890 – 2 "
1890 – 1900 – 3 "
1900 – 1910 – 3 "
1910 – 1920 – 4 "
1920 – 1930 – 2 "
1930 – 1940 – 2 "
1940 – 1950 – 3 "
1950 – 1960 – 2 "
1960 – 1970 – 1 "
1970 – 1980 – 1 "
1980 – 1990 – 2 "
1990 – 2000 – 2 " small bump at 2000'

Decided to case hole at 2000' (limit of our 9 5/8" casing) even though no casing seat found. Only other course would be to continue drilling with 8 3/4 beyond 2000' in search of casing seat for 7" pipe. This

is undesirable because (1) it would increase the interval from which we have no samples. (2) after setting 7" we would not be in a position to case off deeper soft or cavernous sections.

Section in E-1 differs radically from that in F-1. Only cavity in E-1 is at 1157-74 - all of numerous cavities of F-1 are below this level (first about 1250; last about 2775); section drilled today - 1700 - 2000 is all soft - whereas there are many hard and firm beds in this interval in F-1. It will take fossils to tie these two holes together. Plan to take core as soon as casing is set.

Checked with Mr Carey at Hine to be sure there was no 9 5/8" pipe available locally to enable us to go deeper for casing seat. There is no 9 5/8" nor any sort of larger pipe that would enable us to extend our 2000' string — nor is there equipment capable of pulling pipe from E-1.

Took TOTCO reading at 2,000 - 1/2°
Cut at hole to a Hach reaming bit (7 3/4" at bottom - 12 1/4" at sides).
- start reaming at 1:15 PM - bit on fully to remove cement inside surface casing.

2:00 PM - shut down to repair clutch

Rept. sent ONR →

Reamed out balance cement and continued in 155 below 145'. Circulation returned but milky water contained only very fine cuttings; cuttings pile up making it difficult to make connection and difficult to pull Kelly up after drilling it down. With 6 lengths and Kelly down, decide to use single pit mud & lost circ. mud.

Hole cleaned out by this means, circulation lost and then regained. Reaming easy - only 1-2,000 lbs on bit. At 7:15 AM down to 780' - circulate while shift is changed.

June 30 - Mon. - 7 AM - 4 PM - Kadell

8:10 AM - down to 830' - still have circulation

9:20 - " " 955' - circulate, continuing

[illegible] last conn. until [illegible]

9:45 - at 1014'

11:10 - at 1157 on hard layer - 4000 lbs on bit (at 1161')

raised to 9000 lbs at 1164'

- "cavity" (prob just soft) 1169-73

- very hard layer 1205 -

- down to 1307 at end of shift

Note

Cuttings from 1170 to 2000 are

from reaming operation & therefore contaminated more than ordinary. All are fine due to thickness of mud, were caught in 5 gal. bucket as in similar circumstances in F-1.

---

4 PM - June 30 To 8 AM July 1
Imgeward - Russell.

6.25 AM.

Reaming continuously. No serious interruptions (one 10 minute repair job on pump) since 4 PM. Reaming completed at 6 AM to 2000 ft. Payne said hole apparently had been drilled with rock bit only to 1998 for the last 2 feet went very slowly but there was no change in character of cuttings. Although some mud was lost one pump supplying water was sufficient to maintain volume up to [illegible] [illegible] [illegible] another pump was thrown to.

Mud viscosity [illegible]

E-1

Samples to Cole

Notes on Core #1 - 2003 - 2028

Core consists of 4 oriented pieces (longest = 1 ft. in plastic tube; other 3 total 1 ft.), rest of core small, more or less rounded pieces.

Rock is a weakly cemented mass of mollusk shells (*Cardium* and other bivalves), rod-like algae, and small Foraminifera. Corals are rare (one large colony *Porites*, apparently in position of growth). Just also rare and no larger Foraminifera were recognized. Rock looks like near-shore lagoon deposit, no molds seen.

maintained well and
circulation remained good
all way down.
at smaller/ reaming operation

maintained well and circulation remained good all way down.
At end of reaming operation all hands set to getting a full pit of high viscosity mud, preparatory to circulating in cleaned hole for an hour & a half before setting casing.

July 1 – Tues
Ran 2000 ± of 9⅝" casing and cemented with 145 sacks.

July 2 – Wed – WOC.

July 3 – Thurs – noon – midnight Rodd(?)
- 1 PM drilled thru cement – to 2003
- mix mud and clean out hole
- out of hole 5:30, preparing to core
- shut down to wait on [illegible]
- 6:30 PM on bottom with diamond core bbl
- Cored 25' (2003 – 2028) in 7 min. – with low pump pressure
- Recovered 4'6" (=18%) – preserved last 1' in plastic tube – for porosity tests.
- Much of core appears to be sand and fragmentary shell – one large colony *Porites* – see above.

Core #1
Spec p. 4B to Coles 2003-28

(See p 20)

Notes on cuttings (cont.)

160-170	Coarse coral fragments like last — in some cases, at least, yellow calcite replaces orig. coral skeleton, giving casts. No fine forams in fine fractions but most bench types appear to be solid yel calcite, preserving some surface sculpture.
170-180	same yellow calcite Ls
180-190	similar to last; ~~brown~~ [illegible] rare in fine fraction (contamination?) - [illegible] dark [illegible] color as against pale yellow of calcite Amphistegina - same as in 170-180
190-200	Same - [illegible] coral septa perfectly replaced by yellow calcite
200-210	some Yellow calcite Ls like above and pieces of a friable white Ls with numerous moll. (± frag) with original shell and dense tan to brown Ls with more [illegible] [illegible] these two types - the white friable and the dense brown may be same - the latter derived from the former by deposit of calcite & possibly [illegible] finer grades have good moll.

210 - 220	Similar to last; finer grades same.
220 - 230	Coral ls - with yellow calcite
230 - 240	Similar; some of coral with well preserved surface detail; cemented white debris with good mollusks; frag. large bivalve, [illegible] Lithodomus; pieces of tan to brown dense ls with microfossils. Yellow calcite + dark brown dense ls. prob all local spots in friable, white, coral + shell ls.
240 - 250	Like last - good *Mytilus*, tellinid, *Arca* etc - moll. molds more.
250 - 260	Coral-shell ls - many pieces branching coral ½" diameter; some coral perfectly preserved; yellow calcite in few pieces
260 - 270	Similar - some well pres coral, some friable sand and shell; most of coarse (¼"+) fraction is coral; shell not numerous
270 - 280	No change
280 - 290	Similar but less coral, more yellow calcite [illegible] mold of fossil - some good moll. - well preserved coral
290 - 300'	Similar coral and shell ls with parts of [illegible]

fine detritus in dense matrix of yellow calcite; other parts of matrix white and friable - many and varied mollusks - incl. *Pelinaeus*, large *Turbo* operculum. Largest coral fragment 1¾". Few *Halimeda*, corals incl. molds

~~~

300-310 Porous white coral and yellow calcite, coral; - some small shells, rare *Halimeda*

310-320 Coral molds in yellow calcitic material, much of it coarsely crystalline, moll. few, some of them internal molds

320-330 mostly coarse (> ¼"), porous white and dense yellow calcitic coral + shell ls.; practically no fine fraction (mollusks); few moll. molds

330-340 Buff ls with moll. molds, yellow calcite; some moll. with shells in fines

340-350 Buff ls, and hard - with yellow white + numerous moll. molds, few small forams and shell fragments in fines

350-360, 360-370, 370-380, 380-390, 390-400, 400-410, 410-420 } No important change

420-440 — no sample

(see p. 25)
~~~

-1:10 start back in hole

— July 4 - Fri. 11 PM - 8 AM Russell -

5.53 AM. Drilled To 2500 feet. Losing mud steadily but circulation good and samples plentiful. (2078 - 2500)!

July 4 ~ Fri. ~ 8 AM - 4 PM ~ [illegible]

- 2580 - 2745 - mostly firm
- shut down to work on rotary clutch
- On to 2802' - shut down [illegible] AM for minor repairs and to run core bbl - Totco at 2802 = 1/2°
1:50 PM into hole with core bbl.
4 PM start coring
- Core 6'

Rep'd OWR →

July 4 Fri 4 PM - Midnight - Smith
4:30
From 2802 to 2808

	Beg.	End	Act.
3	3:31	331 1/2	1/2
4	345 1/2	347 1/2	2
5		351 1/2	4
6		354 1/2	3
7		357 1/2	3
8		401	3 1/2

E-1

Samples to Cole

(20a)

15 min spent drilling last ft.
Driller presumes head rock
(but wrong by 20)

C+D to Cole
Core #2
2802—2808

15 min spent drilling last ft.
Driller presumes hard rock encountered (but wrongly so)
Recovery 100%.
Core firm to hard, cavernous ls.
Core packed in bbl at 6 1/2', unable to continue coring.
2808'. Tan ls, many moll. molds - no larger forams seen but some 2-spec. tecol.
(Note. During drilling it was thought that a very hard rock had been encountered which was slowing & halting the coring bit. Once the core was recovered and no very hard material found (although recovery was 100% & smooth) explanation seemed very strange. The core was tightly packed & wedged in the barrel because of a firm coating of ~~thick~~ thick drilling mud mixed with lost circulation material. How tightly packed this was became evident when it was found that pounding the barrel was insufficient to remove the core and that it had to be reamed free with ~~steel~~ steel rods.
Probably the core became wedged

in so tightly that no
additional material could enter
the barrel during coring and
thus the bit merely rotated
the barrel being held ~~up~~
up by a cushion of ground-up
rock beneath the barrel.
It would seem if this were
true, that it would be necessary
to make sure that the ground is
not too thick or have the ground
left cuttings [illegible] out of it
before attempting to core. HOWEVER
it should be noted that the
tight packing of ground was
probably responsible for holding
in all the soft core which
was recovered and that if it
were not for this the ~~[illegible]~~
percentage recovery would
probably have been very [illegible] (Even
— even though we could have
cored 25 feet instead of 6 ½
[illegible])

10:30 P.M.
Found 5 to 10 feet of hole [illegible] and
[illegible] filled with cuttings
on returning to drill.

[illegible] | July 5. Saturday 12 mid - 8 AM

Reached bottom [illegible] AM.

7. A.M. Drilled to 3010 ft. Circulation good, mud [illegible] samples plentiful [illegible] 18081 - [illegible]

July 5 - 8AM - 4PM Koelon

Drilling [illegible] at 3010
- At 3097 shut down to work on clutch
- 1:[illegible] PM - resume drilling
- 2 PM - Lost circulation in rough drilling material at 3127'
- Pulled into casing to mix mud [illegible]

July 5 - 4 PM - [illegible] - Smith
" 6 Midnight - 8 AM Connell

Attempt to recover circulation with full pit of mud and lost circulation material failed completely. Decided to drill ahead using sea water. ([illegible] - 11 PM)

[illegible] from 3127 to about 330[illegible] [illegible] from drilling time [illegible] to be generally [illegible] to

July 6 ~ Sunday - 8AM - 4PM ~ Rain

- Shut down to service rig and install additional waterline.
- 8:30 resume drilling - at 3500 ±
- 7:00 PM - 3560 - making connections with little difficulty
- 10:00 PM at 3620 - no trouble making conn.; average time for 10' = 5-6 min. - with 4,000 lbs on bit
- 11 PM - hardening up 3730-40 - continues hard thru 3760 (@ 1½ min per 10')
- 1:05 AM down to 3810 - still hard; circulate to let water build up - still hard at 3820'
- 2 PM - start to work pipe
- softer from 3860 - 4050 ±
- started 4:40 PM at 4079' - last 30' ± @ rate 4-4½ min. per 10'
- can get 20' ± in bbl. without making conn. Pull up several stands (10) mix mud & come out to core

(24)

Notes on cuttings - cont.

440 - 450	- small sample of fine cuttings - similar to 340-350 - except for few moll. molds
450 - 460 } 460 - 470 }	- Same as 340-350
470 - 480	- no sample
480-490 } 490-500 } 500-510 } 510-520 } 520-530 }	- Same as 340-350
530 - 540	- Medium cuttings (none on 1/4 screen) mostly coral, much of it well preserved; frag. moll. with orig. shell - with pitting + [illegible]. This may be top of Tertiary. Rare small forams, crust. frag + ech. spines in finer grade. much of coral slender branching
540 - 550	Same as last
550 - 560	" " " but moll less abundant
560 - 570	Same as 530-540
570 - 580	" " " " but moll. rare & frag.
580 - 590	" " " "
590 - 600	Similar to 530-40, more fragments massive coral.
600 - 610	Same as last
610 - 620	No change
620 - 630	Similar to 530-40 but more frag massive coral and good moll. + small forams.
630 - 640	Like last but moll. even more abundant
640 - 650	" " - see frag. [illegible] + bus [illegible] (Brt) 931

E-1

Samples to Cole

Rich moll 620 — 650; 650 —
Br. ... ...

	-vincrids, ... - cerithium Conus - micro moll + forams in fine fraction
650-660	Similar — see large fragments showing matrix fine debris, some yellow calcite, moll less abundant.
660-670	Very few coarse (1/4" +) cuttings of coral, moll. shells mostly frag; micro-moll
670-680	Same as last
680-690	Like 660-670; 1 piece Millepora; slender branch corals again abundant; also moll.
690-700	-Like 660-670 — micro moll.
700-710	- " " " " "
710-720	Similar to last; small sample, fine cuttings; ... but frag. ... , Trivia, Cerithium, forams + few micro moll.
720-730	Similar; micro moll. abundant } small sample fine cuttings
730-740	" " " }
740-750	" ; " " -brown Margmopora -fragmentary } larger sample fine cuttings

750-760	similar; good micromoll. + forams; small sple; fine cutts.
760-770	" , brown Marginoporas, [illegible] + other small moll.
770-780	Similar; brown Marginoporas more abundant
780-790	" " " rare
790-800	" small brown Marginoporas abundant good micromol
800-810	small sample of fine cuttings; coral and shells (good micromoll. + frags. larger forms; few brown Marginoporas) + other brown forms + variety of white tests.
810-820	Same as last + frag. ech. tests + rare Halimeda - most of mat. passes 20 mesh.
820-830	same as 800-810 -
830-840	Large sample; corals + excellent moll (not chalky like) crust. ech. etc. - Halimeda, [illegible], Cardium, + great variety micromoll
840-850	Like last - [illegible] Cardium, [illegible] - one [illegible] (?)
850-860	Worn coral + shells - some fresh - few forams; lignitic? material - [illegible]

(see p 31)

July 7 ~ Mon. ~ 8 AM – 4 PM Lady

Total 4078' = 10

Ran core bbl. – 4078 – 4100'

Lost [illegible] (1-2-4-3).

- out with core at noon, recovering

4078'
4100

13' out of 22' (=60%) - hard white coralliferous LS. Time log shows several soft layers which probably represent the 40% not recovered.

Two sections of the core sealed promptly in plastic tubes in sea water. One of these is 7" piece the bottom of which lay 5' above bottom of core; other piece 5½" in length, its base 6" above bottom of core (spots from which these samples were taken are filled with wooden blocks in core box 10)

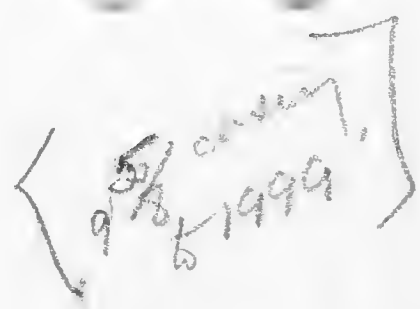
Mixing mud at end of shift. To reamin the 22' cored and continue drilling with 8¾ rock bit until satisfactory casing seat is found — Then run 7" pipe + cement.

July 7 - Mon - 4 PM - 12 midn. Sunny

continued mixing mud
7:15 started reaming for seat
7:35 drilling

	Set	End	Actual
4118	7:34	7:42	8

- to 4120
- Mixed second pit mud - prepared to run 7" casing



July 8 ~ Tues 8AM-4PM ~ Ladd

Ran 7" casing with float shoe and float collar. Ran liner hanger to bottom of 9 5/8" casing @ 1962-63 from Rotary bushing. Circulated for 30 min, then cemented 7" casing with 100 sacks cement, displaced cement with water, backed setting tool out of liner hanger & collapsed packer

7" casing in hole 2140.37'
Liner ——— 6.50
Shoe set at ——— 2108.50'

July 9 ~ Wed ~ WOC

July 10 ~ Thurs. ~ 8AM-4PM Ladd

Wired 2 packets Fluorescien (from life jackets) on bottom of 6 1/4" rock bit; all small drill pipe into hole at end shift

4PM - midnight - Stephenson

Bottom depth - 3992' - 128' cement. (see p. 32)

860-870	Similar; excellent moll.; no lignitic material.
870-880	- Worn + broken coral + moll. + soft, gray lig. clay. - evidently very shallow water dep. - barnacle plate
880-890	Worn shells like last (Cinna [illegible]), worn coral (pebbles), ls. pebble - brown [illegible] rare; one small piece lignite; few pcms clay; little if any fresh coral; worn frag. crabs, ech. tests, small [illegible] (?) (drill mud, prob)
890-900	Broken coral + shell with few chips gray, dense ls.; no clay and only one small chip lignite.
900-910	Few frag. large bivalves (Cardium - Area) little coral, [illegible] gray dense ls. - Small sample.
910-920	Similar to last, moll. more numerous.
920-930	Similar to 890-900; no lignitic clay. Small sample, fine cuttings.
930-940	
940-950	- [illegible] sph. foram.(?)
950-960	- some good moll in fine fraction
960-970	- " " " (Conus, Mytilus, etc.) + micromoll. in finest fraction - [illegible] -type gast.
970-980	- [illegible] clay (prob. drilling mud)
980-990	
990-1000	

July 10	4 PM - Midnight - Stoplesson (cont.)

(from p. 30)

Dye run -

6:26'45" - End of dye run
5:36'32" - Start " " "

50'13" - Circulation time.

Pump - 30 strokes/min.
700 lb pressure
18' Pump - 6¼" liner

7:30 - down to 4108; lost some mud, shut down to build up mud. (7" casing 15 6" off bottom)

9:15 - Drilling started, Circulation seems ok

10:20 - Depth 4152. Lost circulation. Last several feet were hard drilling. Not enough time for return of cuttings, so no samples.

11:00 - Depth 4170'. Circulation returned.

11:30 - Circulation weak, then

E-1

Samples to Cole

4160

4190-lost

4205

lost after adding drill stem. Last mud brought up few black particles.

last after adding drill stem, last
wash brought up few black particles.
Depth 4190.

11:45 - Depth 4196. Drilling hard.

July 11 Midnight — 8:AM Smith

12:00 - Depth 4200. Drilling
very hard. No circulation

4190 - 4200 11:37 - 12: 23
- 4205 (5' in 40 min)
4200 - 4205 12:00 - 1:11 71

The black particles do not
react to acid. - not carbonate

Looks like hard rock under
microscope, fine grain, xtaline,
black. Prob. BASALT

4:00 bit shows considerable wear,
teeth smashed.

4:15 Assemble core bbl
3½" ◇ core

6:30 Core bbl held up
on 4150-4160 bound

drilling slowly.
Driller says cutting through boulder which fell across hole. 4 min.

core #4
4209 6:58-7:10 12
4210 7:10

July 11 ~ Friday 8AM - 4PM ~ [illegible]

Core #4 4208-4211

Finished 3 ft core run (4208-4211) at 7:30 in 32 min. (12-10-10).

9:30 out with core hard, black, black basalt
Recovered 2'11" (=97%)
- 8 pieces - all fit together
- one 8-inch piece from middle preserved in sea water in plastic tube (top this piece 10½" from top of core.
- Diamond bit badly worn on sides

Note on core - Ingerson

The basalt appears hard and fresh at first glance but closer inspection shows that there is much chlorite, especially along fractures and sheathing pyroxene and olivine grains and clusters.

The olivine has the typical glassy luster and conchoidal fracture. Its color is yellowish to brownish depending on the size and compactness of the grains; smaller and more fractured grains showing lighter colors.

The olivine grains cannot be tested readily for hardness. Because of their fractured character and the thick sections they appear to be much softer than a needle or knife point. On one large one however, a needle point was broken. There can be little doubt that these grains are olivine.

The rock, therefore, is an olivine basalt; it does not contain nearly enough olivine however to be called an oceanite or picritic basalt.

The rock is well seamed with calcite veinlets. In the first 3' core there are twelve of these ranging from almost normal to the core axis to angles of almost 45°. One small cross-cutting veinlet connecting two of the flat ones is almost parallel to the axis of the core. It is 3" long and from 0.7 to 2.0 mm. thick.

Some of the veinlets contain enough chlorite to color the calcite a light green, and in some of the thicker ones there are alternate layers of calcite and chlorite and/or highly chloritized slivers of rock. The calcite veinlets in the first 3 ft. core are 1.0 to 14 mm. in thickness, and are separated by distances of from one to eight inches.

Into hole with 6¼ rock bit - No cuttings - clean hole - reamed to 4211. Mix pit mud prior to taking another core. Obtained small return when mud was pumped in.

Core #5
4211-16

7/12/72 - Sunday
2:00 AM Cored 5' 3" hard basalt depth 4211 - 4216' 100% Recovery one 7½' piece (Top of piece 2' from top of core) preserved in seawater in plastic tube

July 12 - 8 AM — 7/8/72 - Full

- 6:30 Coming out of hole with last core

Core #6
4216-22

- 9:45 - Recovering 5'10' = 97% of basalt - one 8" piece sealed in plastic tube - top of this piece is 1'8" below top of core.

Notes on Core 5 + 6 (E. I. 7/12/52)

Core No. 5 is very much like No. 4 for the first 4 feet in spacing, orientation, and thickness of calcite veins; in clinical content; and in proportion of unaltered material.

The lowermost foot of Core No. 5, however, is much more highly veined and fractured than is the (basaltic) material above it. It is so highly fractured that the orientation of only a few of the larger pieces could be determined with certainty and so highly altered that only a small amount of clinical could be plotted with a hand lens.

Core No. 6 is somewhat more highly fractured and veined than is No. 5, but there is no marked change in trend downward. Relatively massive sections continue to alternate with badly fractured zones. In No. 6 there is one calcite vein almost an inch thick (~1.2.5 cm).

The material at the bottom of core No. 6 appears to be more highly altered than is material about as massive and similarly veined higher in the cores. It is very difficult to find olivine with a hand lens in the pieces from the bottom of the hole.

There are no obvious breaks, changes in lithology or irregularity that would indicate that more than a

single flow has been pierced.

As indicated above there is no progressive or continuous change with depth over the interval cored (c. 14 ft.). Prediction of the character of the material still farther down is uncertain of course, but study of the first 14 feet gives the impression that the same type of material—alternating zones of massive and veined and fractured material—probably continues to a considerable depth (at least some hundreds of feet?).